Introduction
There are a variety of online homework platforms which are available for instructors to use in their courses. One such platform is WebWork, an open source program developed in the mid 1990's focused on mathematics. WebWork provides students instant feedback on their homework. These problems can also currently contain over 30,000 problems free for instructors to use.

Objective
Evaluate the impact of moving from five pencil and paper assignments to six online WebWork assignment in CHBE 241: Material and Energy Balances.

Methodology
Fourty WeBWorK problems were developed corresponding to course learning objectives. Each of these problems took on average two hours to develop. This included initially finding a suitable question, creating a generalized solution equation, adding graphics (if any), coding the question, text and solution into WebWork and testing the problem to ensure it functioned properly.

Results and Discussion
Student perspectives:
- Student assignment submissions and assignment grades are similar, however students received higher grades on the first few WebWork assignments, likely due to having multiple attempts
- Student grades show no significant changes.
- Students prefer WeBWorK over pencil and paper assignments

Advantages of WeBWorK include:
1. Instructors can edit and adapt materials for their courses and correct issues directly in the homework system.
2. Problems are dynamic, with changing numerical values.
3. Easy to use interface for students.
4. It is used in a variety of other courses, meaning students may have already encountered and used this system.

Disadvantages of WeBWorK include:
1. It is difficult for students to submit diagrams or explain responses.
2. Time investment to create problems, become familiar with the platform, and debug issues.

Conclusion
WeBWorK saves instructors time overall from assessment and assignment marking to student interaction in class, tutorial and office hours.

Reference / Bibliography
1. ADEE Concept Warehouse (http://wiki.ubc.ca/Science:Math_Exam_Resources)

Acknowledgements
We would like to acknowledge Will Engle, Strategist for Open Education Initiatives at CTLT for supporting this project from conception to completion and beyond including training on the UBC Wiki. Kevin Lindstrom, Resource Librarian, for initial guidance around finding resources and copyright. The Department of Chemical and Biological Engineering for financial and administrative support. The Centre for Teaching, Learning and Technology for supporting the project through access to workshops and training.

Table 1: Average final course grades from fall 2016 and 2017 classes with 95% confidence intervals show no significant grade changes.

<table>
<thead>
<tr>
<th></th>
<th>Fall 2016</th>
<th>Fall 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>71.79 +/- 1.88</td>
<td>70.56 +/- 1.95</td>
</tr>
</tbody>
</table>

Figure 1: A sample WeBWorK problem with instant feedback, note that students can also preview their answer to see how syntax will be interpreted.

Figure 2: Percentage of class submitting assignments in fall 2016 and 2017 courses.

Figure 3: Average grades for assignments in fall 2016 and 2017 courses with 95% confidence intervals.